CSO Area #1	Dry weather flow rate	1.0
	Regulator capacity	3.0
CSO Area #2	Dry weather flow rate	0.5
	Regulator capacity	2.0
CSO Area #3	Dry weather flow rate	1.0
	Regulator capacity	2.0

Springfield CSS Capacities (MGD)

Rational Method

- $Q_{wet} = CiA;$

  Where:

  C = Runoff Coefficient (% Imperviousness)

  i = Rainfall Intensity

  A = Area

- Rainfall intensity "i" is variable

- Not designing the system for a typical or design rainfall event

- Making a determination how the Combined Sewer System (CSS) will react due to a precipitation event

Springfield Hydrologic Flow Balance, $Q_{wet} = CiA$

CSO Area #1
wet weather runoff

(30.8% impervious) x
(1" rain) x (300 acres)

= 2.5 MG runoff per inch of precipitation

CSO Area #2
wet weather runoff

(43.8% impervious) x
(1" rain) x (250 acres)

= 3.0 MG runoff per inch of precipitation

CSO Area #3
wet weather runoff

(56.4% impervious) x
(1" rain) x (150 acres)

= 2.3 MG runoff per inch of precipitation
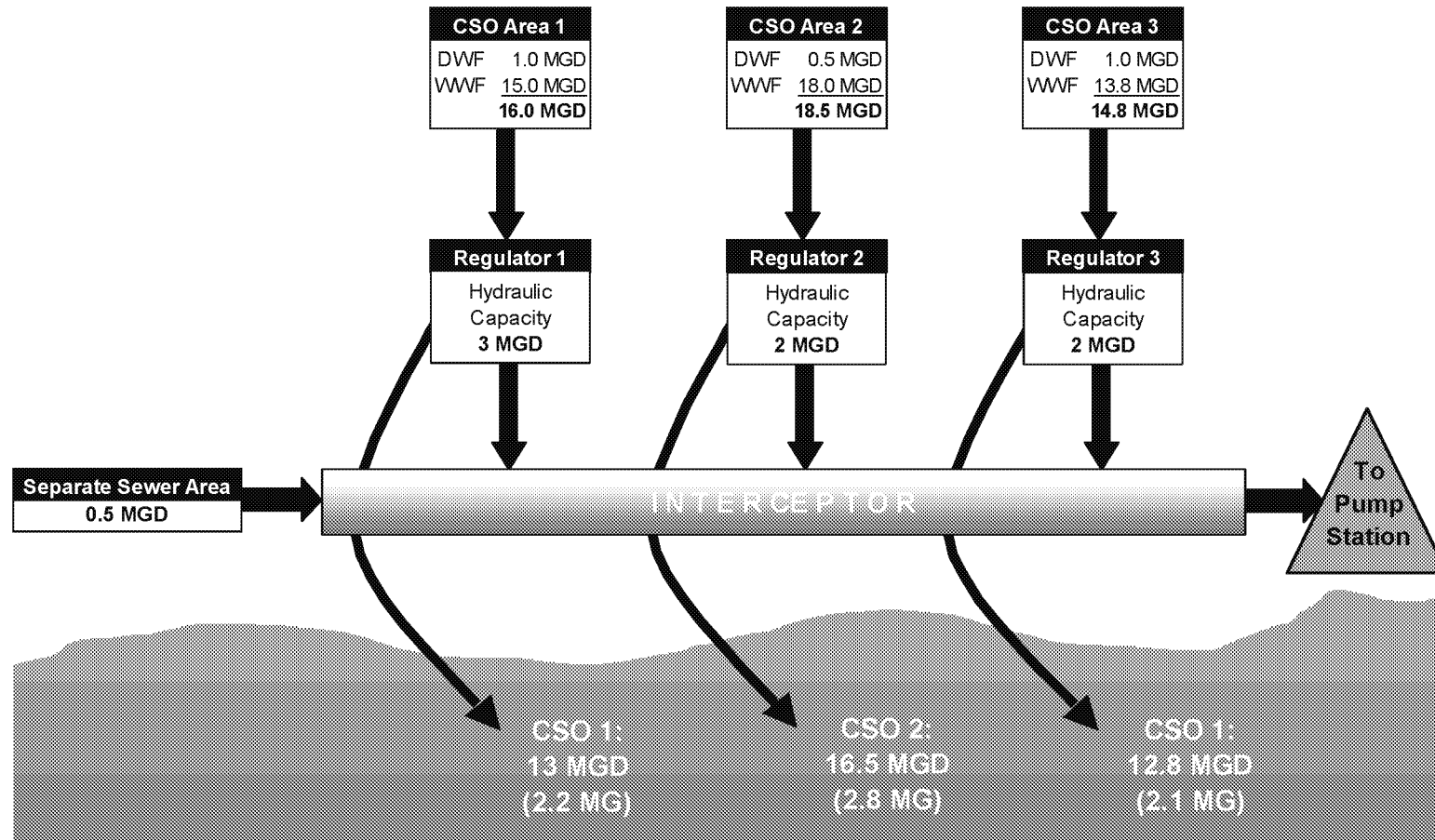
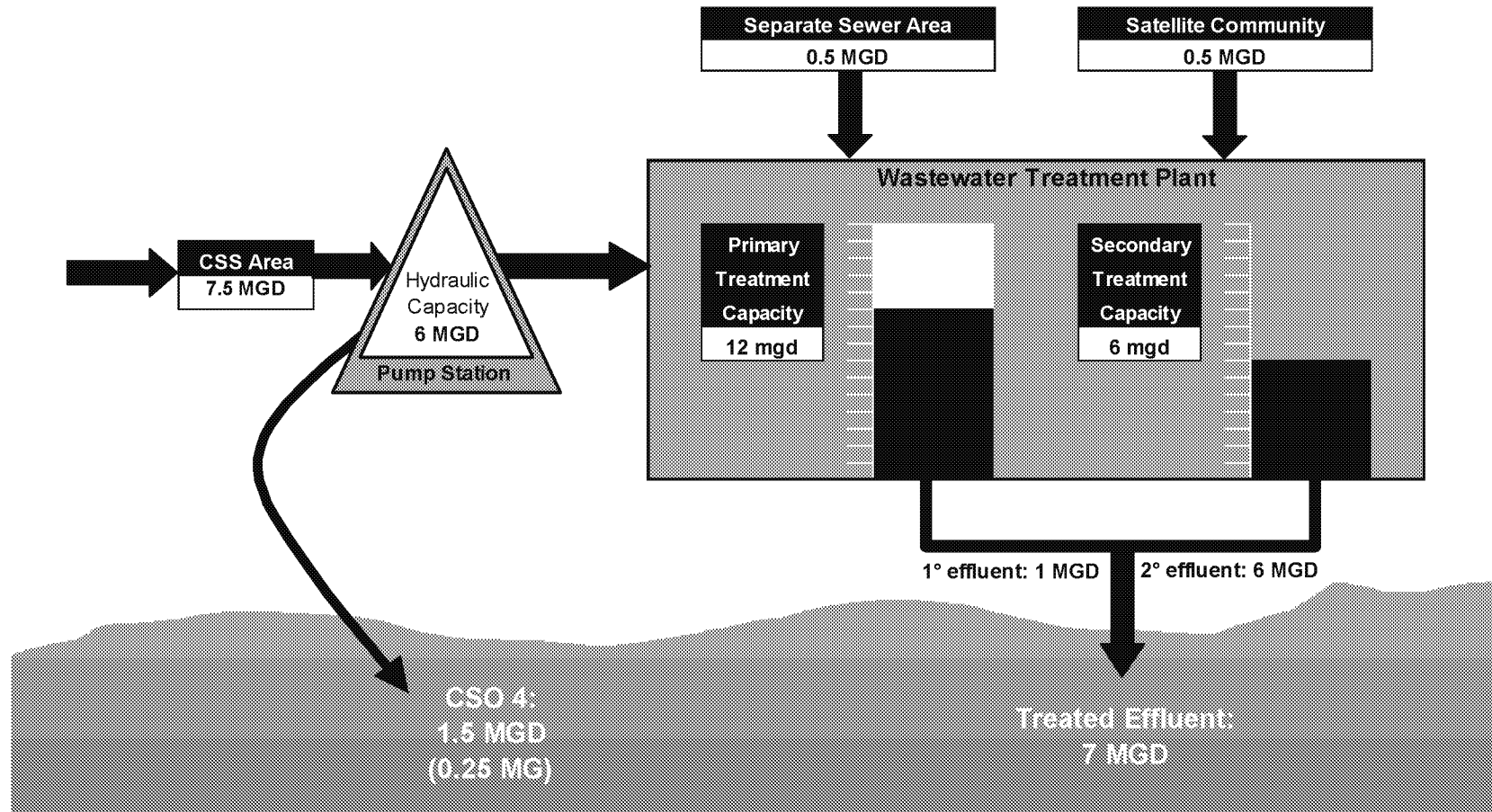C = Runoff Coefficient (% Imperviousness)
i = Rainfall Intensity
A = Area

Springfield: Hydrologic Flow Balance, $Q_{wet} = CiA$

CSO Area #1 wet weather runoff	2.5 MG runoff over 4 hours of rainfall	= 15 MGD average flow rate
CSO Area #2 wet weather runoff	3.0 MG runoff over 4 hours of rainfall	= 18 MGD average flow rate
CSO Area #3 wet weather runoff	2.3 MG runoff over 4 hours of rainfall	= 13.8 MGD average flow rate

Flow Balance Diagram

CSO Area 1	
DWF	1.0 MGD
WWF	15.0 MGD
	16.0 MGD

CSO Area 2	
DWF	0.5 MGD
WWF	18.0 MGD
	18.5 MGD

CSO Area 3	
DWF	1.0 MGD
WWF	13.8 MGD
	14.8 MGD

Regulator 1
Hydraulic Capacity
3 MGD

Regulator 2
Hydraulic Capacity
2 MGD

Regulator 3
Hydraulic Capacity
2 MGD

Separate Sewer Area
0.5 MGD

INTERCEPTOR

To Pump Station

CSO 1:
13 MGD
(2.2 MG)

CSO 2:
16.5 MGD
(2.8 MG)

CSO 1:
12.8 MGD
(2.1 MG)

Flow Balance Diagram

- Total Overflow volume:
  - Pump Station – CSO 04 = 0.25 MG
  - CSO Area 01 = 2.2 MG
  - CSO Area 02 = 2.8 MG
  - CSO Area 03 = 2.1 MG
  - Total = 7.35 MG

For 1 inch. 4 Hours Rainfall Event

Exhibit 3-1. Basic Flow Balance Diagram

River →

CSO 004 = 3.47

Effluent ← WWTP ← Hydraulic Capacity = 50.0

Total Flow = 53.47

1
5.8
0.67
4.60
5.27
↑ 3.8

2
10.0
0.47
11.60
12.07
↑ 8.0

CSO 001 = 2.07 →

CSO 003 = 1.89 ←

5
38.2
1.79
38.30
40.09
↑ 34.9

CSO 002 = 2.64 ←

4
27.5
1.14
29.00
30.14
↑ 25.6

3
22.9
1.02
11.40
12.42
↑ 21.5

N

Legend

27.50	Outlet Sewer Hydraulic Capacity (MGD)
8	Sewer Service Area
1.14	Cumulative Dry Weather Flow (MGD)
31.80	Cumulative Wet Weather Flow (MGD)
32.94	Total Flow (MGD)
22.90	Inlet Sewer Hydraulic Capacity (MGD)

* Cumulative flows = flows from the service area and service areas upstream in the collection system. Wet weather flow values are for the average of several sampled storm events.

Problem Areas and Bottlenecks

- Compare capacity at key locations in the collection system with peak wet weather flow rates
  - ➤ Intersections of major interceptors
  - ➤ Regulators
  - ➤ Pump stations
  - ➤ Cross connections
- Additional study may be required in areas that often flood during wet weather

Example—Bottleneck

- Pump station capacity should equal or exceed capacity of interceptors delivering flow

- Overflow = 5.5+2-6 = 1.5 MGD

From CSO #2
Max. flow = 2 MGD

P.S. capacity 6 MGD

to WWTP

From CSOs #1 and #3
Max. flow = 5.5 MGD